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DIVISION 02 - SITE CONSTRUCTION

SECTION 02534J

LINING OF EXISTING LIFT STATIONS

02/05

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SECTION 02534J

LINING OF EXISTING LIFT STATIONS  
02/05

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NOTE: This guide specification covers the  
requirements for the repair or replacement of  
existing lift station liners.  
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PART 1 GENERAL

1.1 REFERENCES

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NOTE: The following references should not be  
manually edited except to add new references.  
References not used in the text will automatically  
be deleted from this section of the project  
specification.  
\*\*\*\*\*

The publications listed below form a part of this section to the extent  
referenced:

ASTM INTERNATIONAL (ASTM)

ASTM D1238-04c	Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
ASTM D6207-03	Standard Test Method for Dimensional Stability of Fabrics to Changes in Humidity and Temperature
ASTM D638-03	Standard Test Method for Tensile Properties of Plastics
ASTM D792-00	Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

NATIONAL ASSOCIATION OF SEWER SERVICE COMPANIES (NASSCO)

SG-11	Specification Guidelines for Sewer Collection System Maintenance and Rehabilitation
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UNDERWRITERS LABORATORIES (UL)

UL 94	(1996; Rev thru May 2001) Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
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## 1.2 SUBMITTALS

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NOTE: Review submittal description (SD) definitions in Section 01300, "Submittals," and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control. Include a columnar list of appropriate products and tests beneath each submittal description.  
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The following shall be submitted in accordance with Section 01330, "Submittals," in sufficient detail to show full compliance with the specification:

### SD-01 Preconstruction Submittals

Shop drawings, working drawings and samples

A detailed description of equipment and operational procedures to accomplish the lift station rehabilitation including but not limited to sealant mixture design, patching material mixture design, coatings, liner materials, application patching/lining procedures, samples and test data.

Items  
Products  
Tests

## 1.3 REQUIREMENTS

The Contractor shall submit all requested submittals for this section before work begins. Submittals must include, but are not limited to :

Shop drawings  
working drawings  
description of equipment and operational procedures  
Items  
Products  
Tests

## 1.4 QUALITY ASSURANCE

All work shall be performed in strict accordance with the manufacturer's recommendations. Where the applicator/installer is required to be certified by the manufacturer, all training, demonstration and certifications shall be in place prior to beginning the work at the sole expense of the Contractor. Wet well rehabilitation shall be performed by a crew under the direct supervision of a superintendent that has experience in the rehabilitation procedures as specified herein and as considered standard in the industry and per applicable components of SG-11.

Storage, mixing, handling and use of all materials and compounds shall be in strict accordance with the manufacturer's instructions and specifications.

## 1.5 DESCRIPTION

The work included in this section consists of providing all labor, materials and equipment necessary for rehabilitating existing lift stations including:

1. Wet well sealing, plugging, patching and coatings
2. Wet well lining and structural enhancement
  - a. High Density Polyethylene (HDPE concrete protective liner)

Wet wells requiring rehabilitation are identified on the drawings.

## PART 2 PRODUCTS

### 2.1 GENERAL

The materials used shall be designed, manufactured and intended for sewer manhole and/or wet well rehabilitation and the specific application in which they are used. The materials shall have a proven history of performance in sewer manhole and/or wet well rehabilitation. The materials shall be delivered to the job site in original unopened packages and clearly labeled with the manufacturer's identification and printed instructions.

### 2.2 SEALING, PLUGGING, PATCHING AND LINING MATERIALS

Materials used for specific applications shall be as follows:

Patching, filling and repairing non-infiltrating holes, cracks and breaks in concrete and masonry manholes and wet wells:

1. A premixed portland cement-based hydraulic cement consisting of portland cement, graded silica aggregates, special plasticizing and accelerating agents. It shall not contain chlorides, gypsums, plasters, iron particles, or gas-forming agents or promote the corrosion of steel it may come in contact with. Set time approximately 3 minutes or 15 minutes to suit application. One-hour compressive strength approximately 600 psi.
2. Material shall be Preco Patch as manufactured by Fosroc, Inc, Strong Seal QSR as manufactured by Strong Systems, Inc., or an accepted equal.

Manhole and wet well linings for corrosion protection, concrete, block and brick manholes and wet wells:

1. Liner shall be AGRU Sure Grip HDPE (high density polyethylene) with a minimum thickness of 3mm, or acceptable equal. All liner sheets shall be extruded with a large number of anchoring studs, a minimum of 39 per square foot, manufactured during the extrusion process in one piece with the sheet so there is no welding and no mechanical finishing work to attach the studs to the sheet. The liner shall have a minimum pull out of 112.5 lbs. per anchoring stud. Minimum distance between studs shall be no less than 2.1275 inches.
2. Flat liner sheet, non anchored, used for overlapping joints, shall

have a minimum thickness of 3mm. All joints shall be sealed by means of thermal welding performed by lining manufacturer's certified welders.

3. The lining shall have good impact resistance, shall be flexible, and shall have an elongation sufficient to bridge up to a 1/4" settling crack, without damage to the lining. The liner shall be able to bridge any expansion cracks that may occur.
4. The lining shall be repairable at any time during the life of the structure.
5. A lining manufacturer's certified fabricator shall custom fit the liner to the formwork in order to protect the concrete surfaces from sewer gases. The interior surfaces to be protected shall include the walls, ceiling and pipe entries.
6. The lining and welding rod shall be manufactured from the same resins and meet the following properties:

<u>Property</u>	<u>Testing Method</u>	<u>Unit</u>	<u>HDPE</u>
Density	ASTM D792-00-86	g/cm <sup>3</sup>	0.0945
MFI (melt flow index)	ASTM D1238-04c-88	g/10min	(190/5)
Heat Reversion (Dimensional Stability)	ASTM D6207-03-83	%	< 2
Yeild Stress	ASTM D638-03-89	PSI	> or = 2,320
Elongation of Yeild	ASTM D638-03-89	%	> or = 12
Elongation at Break	ASTM D638-03-89	%	> or = 200
Fire Classification	UL 94		V2
Maximum Working Temperature	C° F°		60 140

## 2.3 WET WELL LINING MATERIALS

### Concrete Protective Liner Materials

Concrete: Unless otherwise specified, the concrete shall be a standard 6-bag (Type I/Type II) portland cement mix with pump grade coarse aggregate producing a minimum 4000 psi compressive strength at full cure. If required, a high-strength, quick-setting cement grout shall be used for positioning and sealing the form at the wet well base. All concrete surfaces shall receive a coating for corrosion protection as specified above.

Formwork: The assembled internal wet well form shall have sufficient stiffness and strength to preclude shifting and/or collaspe during concrete placement and to ensure safe man-entry during the procedure.

The assembled form shall have appropriate cross section size to provide an annular space with a 3 inch average and a 1-1/2 inch minimum thickness.

#### 2.4 WET WELL BENCHING

Concrete for placement of fillets shall be Class C, 2500 psi with a 0.50 water cement ratio. Maximum slump shall be 4 inches plus or minus 1 inch.

The fillets, shall be coated with an epoxy compound that when applied shall retain a minimum thickness of 125 mils. Materials shall be Aquatapoxy as manufactured by American Chemical Corporation or acceptable equal.

### PART 3 EXECUTION

#### 3.1 PREPARATION

General: All interior surfaces shall be prepared in strict accordance with the respective material manufacturer's recommendations.

Cleaning: All concrete and masonry surfaces must be cleaned to produce an etched surface with a uniform, adequate profile and porosity to provide a uniform substrate. At a minimum, all concrete or mortar that is not sound or has been damaged by chemical exposure shall be removed. Grease, laitance, loose bricks, mortar, unsound concrete, oils, incompatible existing liners, waxes, form release, curing compounds, efflorescence, sealers, salts, acids or other contaminants must be completely removed.

Water blasting utilizing proper nozzles shall be the primary method of cleaning; however, other methods such as wet or dry sandblasting, acid wash, concrete cleaners, degreasers or mechanical means may be required to properly clean the surfaces. Surfaces on which these other methods are used shall be thoroughly rinsed, scrubbed, and neutralized to remove cleaning agents and their reactant products. Acid etching may be required to assure adherence of some materials being utilized. Prior to initiating work, the Applicator shall submit a copy of the manufacturer's recommendations and the Applicator's proposed materials and procedures to the Government for review.

For all rehabilitation processes described herein, active infiltration shall be stopped by chemical grout sealing or plugging. All large voids in the wet well wall shall be patched.

Wet well steps, pipe ends, pump mounts, lifting hook or eyes or other protrusions shall be removed flush with the wet well interior.

Test prepared surfaces after cleaning but prior to application of the protective liner system to determine if a specific pH or moisture content of the concrete has been achieved. Concrete surfaces tested for pH shall achieve a pH reading of 9 or higher prior to the application of the protective liner material.

All spoil material resulting from the preparatory cleaning, plugging and patching operation shall be removed at the wet well and not allowed to enter the collection system. All spoils removed from the wet well shall be disposed of in a manner acceptable to the Government. All surfaces shall be water washed as needed to remove residual dust, debris, or other blasting materials which could inhibit the proper installation of the protective liner system.

The Contractor shall keep his work areas neat, clean and reasonably free of odor. The Contractor shall bear the responsibility for and provide immediate cleanup of any spills at or near the site or during transport operations.

After cleaning prep work is complete, manufacturer's representative for the protective liner system shall inspect the surface and shall certify in writing that the surface has been adequately and properly prepared to receive their product.

### 3.2 WET WELL SEALING, PLUGGING, PATCHING AND COATING

Stopping infiltration: After surface preparation and prior to the application of coatings, infiltration shall either be stopped by chemical grout sealing or plugging.

Patching: Loose material shall be removed from the area to be patched or repointed exposing a sound sub base. Holes or voids around steps, joints or pipes, spalled areas, and cavities caused by missing or broken brick shall be patched and missing mortar repointed using a nonshrink patching mortar conforming to the requirements of Part 2 - Products, above. Cracks not subject to movement and greater than 1/16 inch in width shall be routed out to a minimum width and depth of 1/2 inch and patched with nonshrink patching mortar as indicated above.

Linings (corrosion protection): Linings systems conforming to the requirements of Part 2 - Products shall be applied to all interior surfaces, excluding the wet well floor. When completed, the lining shall be free of any defects.

### 3.3 WIRE MESH SUPPORT

Prior to installation of the liner all surfaces shall receive a wire mesh material as recommended by the liner manufacturer. The wire mesh shall be supported by Type 304 Stainless Steel anchors sufficient to support the liner and grout installation. The anchors shall be placed on two(2) foot center grids throughout the structure or in any area liner is to be installed.

### 3.3 WET WELL LINING AND STRUCTURAL ENHANCEMENT

HDPE Liner:

The contractor shall place block-outs as needed to provide pipe inlets and outlets of the same diameter through the new lined wall.

The internal form shall be sized, erected and braced as necessary to assure that the new interior wall has an average thickness of 3 inches. The resulting void will be placed with high strength grout. The grout used to anchor the liner shall be Type II Portland grout producing an average 6,500-psi compressive strength in 28 days. Grout shall be placed or pumped in place and vibrated to eliminate voids and to assure that it makes intimate contact with the form and fills all pockets, seams and cracks within the annular space. The vibration shall be adequate but not excessive which might cause segregation of the concrete components. The forming system used to support the liner during the grout pour shall be capable of bracing the liner against compression that would result from the placing of the grout and vibrating of the grout into the void between the

liner's embeds and the existing wall.

The form shall be positioned, sealed and finished at the wet well base using cement grout to assure that concrete does not enter the sewer during the procedure.

The internal form shall be sized, erected and braced as necessary to assure that the new interior wall has an average thickness of 3-inches. The resulting void will be placed with high strength grout. The grout used to anchor the liner shall be Type II Portland grout producing an average 6,500-psi compressive strength in 28 days. Grout shall be placed or pumped in place and vibrated to eliminate voids and to assure that it makes intimate contact with the form and fills all pockets, seams and cracks within the annular space. The vibration shall be adequate but not excessive which might cause segregation of the concrete components. The forming system used to support the liner during the grout pour shall be capable of bracing the liner against compression that would result from the placing of the grout and vibrating of the grout into the void between the liner's embeds and the existing wall.

The form shall be positioned, sealed and finished at the wet well base using cement grout to assure that concrete does not enter the sewer during the procedure.

When the concrete has sufficiently cured to preclude slump or damage, the form shall be removed.

All welding of the protective liner shall be performed in accordance with the published directives and procedures of the manufacturer and by welders certified by the manufacturer. Completion of welding will provide a one piece monolithic concrete protective liner system that will provide excellent resistance to hydrogen sulfide attack and will not pull off the wall in the event that infiltration occurs.

The following welding techniques are acceptable:

- a. Extrusion Welding: For sealing seams and around pipes
- b. Butt Welding: For sealing large sheets together
- c. Hot Air Welding: For tack welding and only to be used for permanent welding in extremely tight conditions where extrusion welding is not possible. Triple pass method must be utilized in this circumstance

Testing and supervision of the installation and welding shall be performed by qualified staff only and must be checked when completed by visually checking and by Spark Testing all welded joints.

A lining manufacturer's certified fabricator shall custom fit the liner to the formwork in order to protect the concrete surfaces from sewer gases. The interior surfaces to be protected shall include the walls, ceiling, and pipe entries.

Sample welds shall be taken from each jobsite during the field welding process and submitted to the quality assurance department for testing. The following tests are performed: Shear and Peel Test. Shear weld test results shall meet or exceed at least 80% strength of parent material in a destructive test, which pulls the sample apart to test the strength and integrity of the extrusion weld. The peel test pulls the weld apart from



the backside of the weld using a peeling type motion. The results of this test shall meet or exceed 70% of the value of the parent material. The tensiometer must be used to pull the samples and carry a current calibration within twelve months. Test results must be printed and turned in to the Government.

Welders must be certified by the lining manufacturer and furnish a welding certification to the contracting officer in the submittals.

#### 3.4 REINSTALLATION OR REPLACEMENT OF WET WELL COVERS

The Contractor shall remove the existing wet well cover and, if they are not being reused, dispose of them as directed by the Contracting Officer. It shall be the responsibility of the Contractor, at no additional cost to the Government, to repair any damage to the structure caused by the removal of the existing cover.

#### 3.5 FIELD QUALITY CONTROL

The resultant concrete structure surfaces shall be leak-free, smooth and free of honeycomb or areas of segregated aggregate. The HDPE liner shall be securely embedded into its surface to produce a continuous protective barrier. At the Owners direction, a 4-inch diameter coupon may be made in the HDPE at a location chosen by the Government to expose the new concrete interior and verify its condition and then sealed by welding. The surface and welds shall be tested at minimum 10,000 volts with a holiday detector for pinholes and holidays. Any defects shall be promptly repaired and re-tested. Inspection and testing shall be performed by the certified applicator in the presence of the Government.

Prior to demobilization from the site, the Contractor shall remove all construction debris, stabilize any spill areas and wash roadway areas affected by the work.

All wet well rehabilitative sealing and/or lining work shall be guaranteed against faulty workmanship and/or materials for a period of one (1) year after the completion of the work. Inspection by the Government or an authorized representative shall be scheduled after the work is complete, and again within the warranty period, to verify that there is no visible leakage. If visible leakage is detected it will be corrected by the Contractor at no additional cost to the Government.

-- End of Section --